TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
R.306610

In Re Application Of: **Friedrich BOECKING**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/576,070	**December 20, 2006**	**K. Coleman**	**02119**	**3747**	**4804**

Invention: **Fuel Injector With Multi-Part, Directly-Controlled Injection Valve Member**

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Dated: **05 November 2008**

Ronald E. Greigg
Registration No. 31,517
GREIGG & GREIGG, P.L.L.C.
1423 Powhatan Street, Suite One
Alexandria, VA 22314
Telephone: (703) 838-5500
Facsimile: (703) 838-5554

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of

Friedrich BOECKING — Before the Board of Appeals

Serial No. 10/576,070 — Art Unit: 3747

Filed: December 20, 2006 — Examiner: K. Coleman

For: FUEL INJECTOR WITH MULTI-PART, DIRECTLY-CONTROLLED INJECTION VALVE MEMBER

Date: November 5, 2008

APPELLANT'S BRIEF (37 CFR 41.37)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief is filed in support of the Notice of Appeal filed on September 15, 2008, appealing the Examiner's decision of making final a rejection of claims 11-21.

The $540 fee for this Appeal Brief and any other required fee should be charged to Deposit Account No. 07-2100 by the attached deposit account form.

I - REAL PARTY IN INTEREST

The real party in interest in this appeal is:

Robert Bosch GmbH

Zentrale Patentabteilung

Postfach 30 02 20

D-70442 Stuttgart, Germany

II - RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences. None

III - STATUS OF CLAIMS

A. TOTAL NUMBER OF CLAIMS IN APPLICATION - Eleven (11)

Claims in the application are: 11-21.

B. STATUS OF ALL THE CLAIMS

1. Claims canceled: 1-10.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 11-21.
4. Claims allowed: None.
5. Claims rejected: 11-21.

C. CLAIMS ON APPEAL

The claims on appeal are: 11-21.

IV - STATUS OF AMENDMENTS

An amendment was filed on August 13, 2008, subsequent to the final rejection. An Advisory Action was mailed on September 3, 2008, indicating that the amendment filed on August 13, 2008, would not be entered for purposes of appeal. Thus, no amendments to the claims have been made subsequent to the final rejection.

V - SUMMARY OF CLAIMED SUBJECT MATTER

In the following summary, all references to pages and lines can be found in the original English-language specification filed on April 14, 2006. However, it should be noted that the original English-language specification contained a number of minor errors that were corrected by the preliminary amendment also filed on April 14, 2006.

Independent claim 11 is directed to fuel injector (1) for a common rail injection system for injecting fuel into a combustion chamber (43) of an internal combustion engine, the injector having

an injector body (2) (p. 4, ll. 14, 15),

a nozzle body (3) (p. 4, ll. 15),

a multi-part injection valve member (21) having an inner needle part (23) and an outer needle part (22) received in the nozzle body (p. 5, ll. 15, 16),

a piezoelectric actuator (6) (p. 4, ll.17-19; p. 8, l. 3),

a hydraulic booster assembly (9) connected downstream of the piezoelectric actuator (p. 4, ll.17-19), and

first (19) and second (20) control chambers associated with the injection valve member for actuating the valve member (p. 5, ll. 10-14), the improvement wherein

the hydraulic booster assembly actuated by the piezoelectric actuator comprises a first booster chamber (13) hydraulically connected to second control chamber (20) that actuates the outer needle part (22), (p. 5, ll. 18-20) and

a second booster chamber (17) hydraulically connected to the first control chamber

(19) that actuates the inner needle part (p. 5, ll. 16-18).

Independent claim 21 is directed to a common rail injection system for injecting fuel into a combustion chamber (43) of an internal combustion engine, the injector having

an injector body (2) (p. 4, ll. 14, 15),

a nozzle body (3) (p. 4, ll. 15),

a multi-part injection valve member (21) having an inner needle part (23) and an outer needle part (22) received in the nozzle body (p. 5, ll. 15, 16),

a piezoelectric actuator (6) (p. 4, ll.17-19; p. 8, l. 3),

a hydraulic booster assembly (9) connected downstream of the piezoelectric actuator (p. 4, ll.17-19), and

first (19) and second (20) control chambers associated with the injection valve member for actuating the valve member (p. 5, ll. 10-14), the improvement wherein

the hydraulic booster assembly actuated by the piezoelectric actuator comprises a second booster chamber (17) acts upon a first control chamber (19) for triggering the inner needle part (23) (p. 5, ll. 16-18), and

a first booster chamber (13) acts on a second control chamber (20) for triggering the outer needle part (22) (p. 5, ll. 18-20).

VI - GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 11-20 stand rejected under 35 U.S.C. 103(a) as unpatentable over Tsumura et al (US 4,381,077) in view of Schechter et al (US 4,899,714).

Claim 21 stands rejected under 35 U.S.C. 103(a) as unpatentable over Tsumura et al (US 4,381,077) in view of Schechter et al (US 4,899,714) in combination with Benson (US 3,501,099).

VII - ARGUMENTS

A. The § 103 rejection of Claims 11-20

In the Final Rejection (FR), the examiner reads claim 11 on Tsumura et al as follows (using the reference numerals in Figs. 1 and 2 of Tsumura el al):

an injector having an injector body (16),

a nozzle body (18),

a multi-part injection valve member having an inner needle part (60) and an outer needle part (22) received in the nozzle body,

an actuator (38),

a first control chamber (air supply, not shown in Tsumura's drawings, connected to air conduit 28) and a second control chamber (fuel tank, not shown in Tsumura's drawings, connected to fuel conduit 26) associated with the injection valve member for actuating the valve member, and

a hydraulic booster assembly connected downstream of and actuated by the actuator comprises a first booster chamber (68) hydraulically connected to the second control chamber (fuel tank connected to fuel conduit 26) that actuates the outer needle part (22), and a second booster chamber (62) hydraulically connected to the first control chamber (the source of air connected to air conduit 28) that actuates the inner needle part (60).

Thus, it is the examiner's position that all of the elements of claim 11 are taught by Tsumura el al, except for a teaching of a fuel injector "for a common rail injection system" and a "piezoelectric" actuator (FR, pp. 3 and 4).

Claim 11 requires, inter alia, a hydraulic booster assembly actuated by a piezoelectric actuator comprising a first booster chamber hydraulically connected to a second control chamber that actuates an outer needle part, and a second booster chamber hydraulically connected to a first control chamber that actuates an inner needle part.

In other words, claim 11 requires a hydraulic booster assembly comprising: (i) a first booster chamber which is hydraulically connected to a second control chamber and that (ii) the a second control chamber actuates an outer needle part; and (iii) a second booster chamber which is hydraulically connected to a first control chamber; and that (iv) the first control chamber actuates an inner needle part.

The examiner reads the "first booster chamber" on the space 68 (see Fig. 2 of Tsumura et al) and the "second control chamber" on the fuel tank connected to fuel conduit 26 (actually Tsumura et al teaches that the conduit 26 is connected to a fuel injection pump, see, col. 2, ll. 57-59). However, the space 68 is not "hydraulically connected " to the fuel tank/fuel injection pump which is connected to fuel conduit 26.

Tsumura et al teaches that the radial passages 66 in the stem of the piston 22 are open to the bore 40 in the nozzle body 16 when the piston 22 is in the elevated position (presumably this means that the space 62 is vented to the atmosphere), and during the descent of the piston, become open to the "space" 68 (Fig. 2) created between the piston shoulder 48 and the opposed surface 50 of the nozzle body (col. 3, ll. 32-37). Thus, one of ordinary skill would understand that before the piston 22 is actuated by the actuating mechanism 14 (from the position shown in Fig. 1 to the position shown in Fig. 2), if the space 68 exists at all in the

position illustrated in Fig. 1, the space 68 would be vented to the atmosphere via bore 40. There is no teaching in Tsumura et al of any hydraulic connection between the space 68 and the fuel tank/fuel injection pump connected to fuel conduit 26. Thus, Tsumura et al does not teach (i) a first booster chamber which is hydraulically connected to a second control chamber and the examiner's finding to the contrary is clearly erroneous.

Further, there is no teaching in Tsumura et al that (ii) the second control chamber "actuates" an outer needle part. In Tsumura et al, the "outer needle part" (piston 22) is actuated by the actuating mechanism 14 comprising rocker arm 52 (see, col. 3, ll. 15-18 and col. 4, ll. 13-16) and the examiner's finding to the contrary is clearly erroneous.

The examiner reads the "second booster chamber" on the pressure chamber 62 of Tsumura et al and the "first control chamber" on the air supply connected to air conduit 28. However, the pressure chamber 62 (see Fig. 1 of Tsumura et al) is not "hydraulically connected to" the air supply which is connected to air conduit 28.

Tsumura et al specifically teaches that the nozzle body 16 and the piston 22 define a **pressure-tight** premixing chamber 24 (col. 2, ll. 51-54) and that when the piston is in its downward compression stroke, the piston 22 compresses the fuel-air mixture trapped in the **closed** premixing chamber 24 (col. 4, ll. 17-20). One of ordinary skill in the art would understand these teachings to mean that the premixing chamber 24 is not hydraulically connected to the pressure chamber 62. If it were, the premixing chamber 24 would not be closed or pressure-tight. Thus, Tsumura et al does not teach (iii) a second booster chamber which is hydraulically connected to a first control chamber and the examiner's finding to the

contrary is clearly erroneous.

Further, there is no teaching in Tsumura et al that (iv) the "first control chamber" (the source of air connected to air conduit 28) actuates the "inner needle part" (the plunger 60).

Tsumura et al actually teaches that the plunger 60 "remains substantially stationary" as the piston 22 moves downward from the position shown in Fig. 1 and it is not until "the piston 22 moves into positive engagement with the top 74" of the plunger 60 that the plunger is lowered (col. 4, ll. 21-30). In other words, the plunger 60 is actuated by direct mechanical engagement between the piston 22 and the plunger 60, not by the source of air connected to air conduit 28. Thus, Tsumura et al does not teach (iv) a first control chamber that actuates an inner needle part and the examiner's finding to the contrary is clearly erroneous.

Furthermore it is pointed out that in the Tsumura et al reference, the injector belongs to a "pumpe-Düse-Einheit" (unit injector), in which the injection pressure is generated by the unit itself, not by a pressure reservoir (common rail) as in the injector of the present invention. Thus, the piston 22 in Tsumura is part of the fuel pump. In fact, piston 22 is the pump piston in Tsumura et al. It is driven by the cam 52 and generates the injection pressure within chamber 24. Consequently, the piston 22 cannot be an external needle as well. It does not, itself, open and close an injection opening. The injection valve member in Tsumura et al is a one piece valve member, it has only one needle, namely, the needle 60.

Schechter et al is cited in the final rejection for a teaching of a fuel injector for a common rail injection system and a teaching of a piezoelectric actuator.

However, like Tsumura et al, there is no teaching in Schechter et al of a fuel injector

comprising a hydraulic booster assembly actuated by a piezoelectric actuator comprising a first booster chamber hydraulically connected to a second control chamber that actuates an outer needle part, and a second booster chamber hydraulically connected to a first control chamber that actuates an inner needle part.

Therefore, even if it had been obvious for one of ordinary skill in the art to combine the teachings of Tsumura et al and Schechter in the manner suggested by the examiner, one would not have arrived at the subject matter defined by claim 11 and its dependent claims.

B. The § 103 rejection of Claim 21

Claim 21 requires, inter alia, a hydraulic booster assembly actuated by an actuator comprising a second booster chamber that acts upon a first control chamber for triggering an inner needle part and a first booster chamber acting on a second control chamber for triggering an outer needle part.

In other words, claim 21 requires a hydraulic booster assembly comprising: (i) a second booster chamber that acts upon a first control chamber and that (ii) the action of the a second booster chamber upon the first control chamber triggers the inner needle part; and (iii) a first booster chamber that acts on a second control chamber; and that (iv) the action of the first booster chamber on the second control chamber triggers the outer needle part.

The examiner reads the "second booster chamber" on the pressure chamber 62 of Tsumura et al and the "first control chamber" on the air supply connected to air conduit 28. However, the pressure chamber 62 (see Fig. 1 of Tsumura et al) does not "acts upon" the air

supply connected to air conduit 28 "for triggering the inner needle part," that is, the plunger 60. In fact, there is no teaching in Tsumura et al of any action by the pressure chamber 62 on the air supply connected to the air conduit 28. Thus, Tsumura et al does not teach (i) a second booster chamber that acts upon a first control chamber and the examiner's finding to the contrary is clearly erroneous.

Further, there is no teaching in Tsumura et al (ii) that the action of the "second booster chamber" (62) upon the "first control chamber" (the air supply connected to air conduit 28) triggers the "inner needle part" 60.

Tsumura et al actually teaches that the plunger 60 "remains substantially stationary" as the piston 22 moves downward from the position shown in Fig. 1 and it is not until "the piston 22 moves into positive engagement with the top 74" of the plunger 60 that the plunger is lowered (col. 4, ll. 21-30). In other words, the plunger 60 is actuated by direct mechanical engagement between the piston 22 and the plunger 60. The "second booster chamber" (pressure chamber 62) does not trigger, move or in any way effect movement of the "inner valve needle" (the plunger 60). Thus, Tsumura et al does not teach that (ii) the action of the a second booster chamber upon the first control chamber triggers the inner needle part and the examiner's finding to the contrary is clearly erroneous.

The examiner reads the "first booster chamber" on the space 68 (see Fig. 2 of Tsumura et al) and the "second control chamber" on the fuel tank connected to fuel conduit 26 (actually Tsumura et al teaches that the conduit 26 is connected to a fuel injection pump, see, col. 2, ll. 57-59). The space 68 does not "act" on the fuel tank/fuel injection pump

connected to fuel conduit 26.

Tsumura et al teaches that the radial passages 66 in the stem of the piston 22 are open to the bore 40 in the nozzle body 16 when the piston 22 is in the elevated position (presumably this means that the space 62 is vented to the atmosphere), and during the descent of the piston, become open to the space 68 (Fig. 2) created between the piston shoulder 48 and the opposed surface 50 of the nozzle body (col. 3, ll. 32-37). There is no teaching in Tsumura et al of any action by the space 68 on the fuel tank/fuel injection pump connected to fuel conduit 26. Thus, Tsumura et al does not teach (iii) a first booster chamber that acts on a second control chamber and the examiner's finding to the contrary is clearly erroneous.

Still further, there is no teaching in Tsumura et al that (iv) the action of the first booster chamber on the second control chamber triggers the outer needle part. In Tsumura et al, the "outer needle part" (piston 22) is "triggered" or actuated by the actuating mechanism 14 comprising rocker arm 52 (see, col. 3, ll. 15-18 and col. 4, ll. 13-16). Thus, Tsumura et al does not teach that (iv) the action of the first booster chamber on the second control chamber triggers the outer needle part and the examiner's finding to the contrary is clearly erroneous.

Schechter et al is cited in the final rejection for a teaching of a fuel injector for a common rail injection system and a teaching of a piezoelectric actuator.

Schechter et al does not disclose a fuel injector having two needle parts guided coaxially one inside the other, much less the first and second control chambers and the first and second booster chamber required by claim 21.

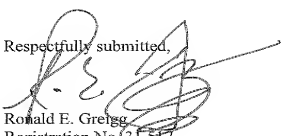
Like Tsumura et al and Schechter et al, Benson does not teach the first and second control chambers and the first and second booster chambers required by claim 21.

Therefore, even if it had been obvious for one of ordinary skill in the art to combine the teachings of Tsumura et al, Schechter and Benson in the manner suggested by the examiner, one would not have arrived at the subject matter defined by claim 21.

Conclusion

For the reasons stated above, the appellant requests that the Examiner's rejections of the claims be reversed.

Respectfully submitted,



Ronald E. Greigg
Registration No. 31,517
Attorney for Appellants
CUSTOMER NO. 02119

GREIGG & GREIGG, P.L.L.C.
1423 Powhatan Street
Suite One
Alexandria, Virginia 22314

Telephone: 703-838-5500
Facsimile: 703-838-5554

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VIII - CLAIMS APPENDIX

11. **(Rejected)** In a fuel injector for a common rail injection system for injecting fuel into a combustion chamber of an internal combustion engine, the injector having an injeetor body, a nozzle body, a multi-part injection valve member having an inner needle part and an outer needle part received in the nozzle body, a piezoelectric actuator, a hydraulic booster assembly connected downstream of the piezoelectric actuator, and first and second control chambers associated with the injection valve member for actuating the valve member, the improvement wherein the hydraulic booster assembly actuated by the piezoelectric actuator comprises a first booster chamber (13) hydraulically connected to second control chamber (20) that actuates the outer needle part (22), and a second booster chamber (17) hydraulically connected to the first control chamber (19) that actuates the inner needle part.

12. **(Rejected)** The fuel injector as recited in claim 11, wherein the first booster chamber communicates with a second control chamber for the outer needle part via a conduit, and the second booster chamber communicates with a first control chamber for the inner needle part.

13. **(Rejected)** The fuel injector as recited in claim 11, further comprising a pressure chamber embodied between the needle parts guided one inside the other, of the multi-part injection valve member, which pressure chamber can be filled from a nozzle chamber surrounding the multi-part injection valve member.

14. **(Rejected)** The fuel injector as recited in claim 11, further comprising a first and a second pressure step on the outer needle part and acting in the opening direction.

15. **(Rejected)** The fuel injector as recited in claim 13, further comprising a first and a second pressure step on the outer needle part and acting in the opening direction, the second pressure step being embodied in said pressure chamber.

16. **(Rejected)** The fuel injector as recited in claim 11, further comprising a pressure step embodied on the inner needle part, on the end thereof toward the combustion chamber, the hydraulic area of said pressure step on the inner needle part being operative in the opening direction of the inner needle part being less than the hydraulically operative areas of the first and second pressure steps of the outer needle part.

17. **(Rejected)** The fuel injector as recited in claim 11, wherein the hydraulically operative areas, in the opening direction, of the pressure steps of the outer needle part exceed the hydraulically operative area on the end toward the combustion chamber of the inner needle part.

18. **(Rejected)** The fuel injector as recited in claim 11, further comprising a first seat formed on engine is subjected to a load that is increased by the amount of the increased moment.

19. **(Rejected)** The fuel injector as recited in claim 11, wherein the piezoelectric actuator is integrated with the fuel inlet.

20. **(Rejected)** The fuel injector as recited in claim 11, further comprising first injection openings that can be opened or closed by the first seat and second injection openings that can be opened or closed by the second seat, said first and second injection openings being embodied on the nozzle body and opening in the direction of the combustion chamber.

21. **(Rejected)** In a fuel injector for a common rail injection system for injecting fuel into a combustion chamber of an internal combustion engine, the injector having an injector body, a nozzle body, a multi-part injection valve member having an inner needle part and an outer needle part received in the nozzle body, a piezoelectric actuator, a hydraulic booster assembly connected downstream of the piezoelectric actuator, and first (19) and second (20) control chambers associated with the injection valve member for actuating the valve member, the improvement wherein the hydraulic booster assembly actuated by the piezoelectric actuator comprises a second booster chamber (17) acts upon a first control chamber (19) for triggering the inner needle part (23), and a first booster chamber (13) acts on a second control chamber (20) for triggering the outer needle part (22).

IX - EVIDENCE APPENDIX

None

X - RELATED PROCEEDINGS APPENDIX

None